

Standard Operating Procedure For Total Suspended Solids (Total Non-Filterable Residue)

1.0 Location

Total suspended solids determinations are performed in the Spectroscopy Lab, Room 305.

2.0 Purpose

The purpose of this method is to determine the amount of suspended solids contained in an aqueous sample.

3.0 Scope

3.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes.

3.2 Total non-filterable residue is retained material on a standard glass fiber filter after filtration of a well mixed sample and dried at 103-105° C to constant weight.

4.0 Reference

4.1 Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020), March, 1979, Method 160.2

4.2 Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, Method 2540 D.

5.0 Sample Handling and Preservation

5.1 Large floating matter and non-representative particulates such as leaves, sticks, fish, large bugs and lumps of fecal matter should be excluded from the sample if it is determined that their inclusion is not desired in the final result.

5.2 No preservatives are used. Analysis should begin as soon as possible. Samples should be refrigerated or iced to 4° C to minimize microbiological decomposition of solids. Samples are stored in the walk-in cooler in the garage.

5.3 The holding time is 7 days from time of collection..

6.0 Apparatus and Materials

- 6.1 Gooch crucibles
- 6.2 Whatman 934-AH, 2.1 cm glass fiber filter disks ($1.5\mu\text{m}$)
- 6.3 Suction flask with Gooch adapter, connected to sink faucet
- 6.4 Drying oven, 103-105°C.
- 6.5 Desiccator, with desiccant that indicates moisture with a color change. Make sure desiccant is dry and blue color. Change at least monthly or as needed.
- 6.6 Analytical balance, capable of weighing to 0.1 mg.
- 6.7 Graduated cylinder
- 6.8 Wide mouth pipet
- 6.9 Pan
- 6.10 Forceps
- 7.0 Procedure
 - 7.1 Preparation of glass fiber filter disk
 - 7.1.1 Place clean Gooches in pan. Using forceps, place the disk on the bottom of a Gooch crucible with smooth side down and the orange peel side up.
 - 7.1.2 Apply vacuum to suction flask, place a Gooch on the suction flask. Rinse the disk with three successive 20 ml volumes of deionized water. Continue the suction to remove all traces of water from the disk, about 1-3 minutes after all liquid passes through.
 - 7.1.3 Put the Gooch crucibles in the pan in the oven. Record temperature and time on worksheet. Dry Gooches at 103-105°C. for at least 2 hours.
 - 7.1.4 Remove from oven and transfer from pan to desiccator. Allow to cool at least one hour before using. Use within one week or redry before using. Weigh immediately before use. Use forceps to move

Gooches for weighing, do not touch with fingers before weighing.

7.2 Determine sample volume to be used. First look at sample.

7.2.1 If clear start with 200 ml.

7.2.2 If partly cloudy start with 100 ml.

7.2.3 If very dense or green, start with 50 ml or use wide mouth pipet for amounts less than 30 ml.

7.2.4 Amount on filter must be at least 1 mg. but not more than 200 mg., since excessive residue on the filter may entrap water and extend the drying time.

7.2.5 The total volume filtered does not need to be more than 200 ml.

7.3 Sample analysis

7.3.1 Weigh pre-dried Gooch from desiccator and record weight and identifying number on worksheet.

7.3.2 Assemble filtering apparatus and begin suction by turning on water.

7.3.3 Place weighed Gooch on apparatus and wet filter with deionized water.

7.3.4 Sample should be warmed to room temperature by placing in a pan of hot water. Shake sample vigorously for at least 20-40 seconds. Without delay quickly measure predetermined amount from section 7.2 into a graduated cylinder. Pour into correctly numbered Gooch and filter until all sample passes through. Record amount filtered on worksheet.

7.3.5 With suction on, rinse cylinder with water and pour over filter to rinse retained residue. Rinse with three, 10 ml portions of deionized water. Allow complete drainage between each rinse. Apply suction for 1- 3 minutes after last rinse. These rinses are important to remove any dissolved solids which may become trapped on the filter or residue.

- 7.3.6 Remove Gooch from flask and place in pan. Place pan in oven and allow Gooches to dry for at least 2 hours at 103-105°C. Record temperature and time on worksheet.
- 7.3.7 Remove pan from oven. Place Gooches only into desiccator. Allow to cool at least 1 hour before weighing. Gooches should be weighed as soon as possible.
- 7.3.8 Weigh Gooch and record weight on worksheet.
- 7.3.9 Do each sample in duplicate. Chain of custody (W) samples are done in triplicate.

8.0 Quality Control

- 8.1 All samples are done in duplicate except chain of custody samples are done in triplicate.
- 8.2 Duplicates must be within 15% except for very low levels. Any sample with differences above 15% must be rerun.

9.0 Data Analysis

- 9.1 Calculate total suspended solids as follows:

$$\text{TSS, mg/l} = \frac{(A - B) \times 1000 \times 1000}{C}$$

where:

A = weight of filter and Gooch and residue in g

B = weight of filter and Gooch in g

C = ml of sample filtered

- 9.2 If the weight difference (A - B) is less than .001 g, then a less than value is reported depending on the amount filtered. If a **200 ml** volume is used and the weight difference is 0.0008 g then a **<5 mg/l** value is reported. For 250 ml, report <4 mg/l. If less than 200 ml was used and the difference is <0.001 g, the sample must be rerun.

10.0 Documentation

10.1 Record all data on worksheet.

10.2 Record Gooch number and weight before and after filtering sample.

10.3 Record log number and amount of sample filtered.

10.4 Record temperature of oven and time pan put in.

11.0 Records

TSS worksheets are stored in the TSS book in the BOD area in Room 305. Printouts from the LMS are stored in the TSS LMS book.